REMARKS

Claims 1-20 are pending in the application. Claims 1, 7, 10 and 17 have been amended for clarification purposes. Favorable reconsideration in light of the remarks which follow is respectfully requested.

The Amendments

The independent claims have been amended to disclaim passivating film generating solutions having a pH greater than about 6. Support for the amendment exists in the specification, for example, on page 6, line 2.

The Primary Obviousness Rejection

Claims 1-3, 5, 7-11, 14, and 16 have been rejected under 35 U.S.C. § 103(a) over Uozumi (U.S. Patent 6,261,953) in view of Kondo (U.S. Patent 6,596,638). Uozumi relates to forming a copper oxide film on a copper surface using an ammonia-hydrogen peroxide solution having a pH of 8-10, then removing the copper oxide film with a solution having a weak oxidizing property such as a diluted hydrochloric acid solution. The copper oxide film contains an ammonia complex. Uozumi clearly teaches that the presence of ammonia is important (see Col. 10, line 38).

Kondo relates to a polishing method for metal films involving mechanically rubbing a metal surface with an oxidizer (such as hydrogen peroxide) and a substance which renders oxides water soluble (such as inorganic or organic acids). However, in the Background section, Col. 5, lines 17-31 describes polishing solutions containing either citric acid or aminoacetic acid and hydrogen peroxide. Figure 26 and Figure 9 of Kondo show corrosion rates (etch rates) and passivation rates (formation of copper oxide) of the citric acid-hydrogen peroxide polishing solution and the aminoacetic acid-hydrogen peroxide polishing solution.

The Examiner contends that it would have been obvious to replace the ammonia-hydrogen peroxide solution of Uozumi with the citric acid-hydrogen peroxide polishing

solution of Kondo to provide a wider range of stability for etch process, as taught by Figure 26 of Kondo. The Examiner notes that the sharp rise in etch rate versus pH for the ammonia-hydrogen peroxide solution of Uozumi as shown in Figure 6 is not desirable for process control.

The Examiner further contends that it would have been obvious to use an organic acid of Kondo in the second solution of Uozumi because Kondo indicates copper and copper oxide are rendered water soluble thereby.

Applicants respectfully disagree with both contentions made by the Examiner for several reasons. Essentially, there would have been no motivation for one skilled in the art to make the modifications proposed by the Examiner to either the first or second solution of Uozumi.

It would NOT have been obvious to replace the ammonia-hydrogen peroxide solution of Uozumi with the citric acid-hydrogen peroxide polishing solution of Kondo because 1) it would fundamentally change the process of Uozumi, and 2) it would obviate the use of the second solution of Uozumi.

The basic, fundamental two step process of Uozumi involves forming a copper oxide film that contains an ammonia complex, and then removing the copper oxide film using a dilute acid with a weak oxidizing property. The citric acid-hydrogen peroxide polishing solution of Kondo, as taught by Figure 26, etches copper. That is, the corrosion rate is the rate at which copper is etched. This is because citric acid can solubilize copper. The citric acid-hydrogen peroxide polishing solution of Kondo does NOT generate copper oxide. Generating copper oxide is the passivation rate. Since the citric acid-hydrogen peroxide polishing solution of Kondo would NOT generate a copper oxide film, on which the process of Uozumi is predicated, substituting the citric acid-hydrogen peroxide polishing solution of Kondo for the ammonia-hydrogen peroxide solution of Uozumi would fundamentally change the process of Uozumi. One skilled in the art would not change basic, two step process of Uozumi. For at least this reason, the alleged combination fails to establish a *prima facie* case of obviuosness.

The purpose of the second solution of Uozumi is to etch or remove a copper oxide film. Since citric acid-hydrogen peroxide polishing solution of Kondo does NOT generate a copper oxide film, substituting the citric acid-hydrogen peroxide polishing solution of Kondo for the ammonia-hydrogen peroxide solution of Uozumi would obviate the use of the second solution of Uozumi. One skilled in the art would not have undermined the purpose of the ammonia-hydrogen peroxide solution of Uozumi (forming a copper oxide film) by using a polishing solution that cannot form a copper oxide film.

For at least these reasons, it would not have been obvious to replace the first solution of Uozumi with the citric acid-hydrogen peroxide polishing solution of Kondo. It is believed that the comments above are sufficient to merit withdrawal of the rejection. Nevertheless, the following comments are also provided.

It would NOT have been obvious to modify the second solution of Uozumi as suggested by the Examiner because the modification would contradict the basic requirements of the second solution of Uozumi.

It would not have been obvious to use an organic acid of Kondo or the acetic acid mentioned in the Background section of Uozumi in the second solution of Uozumi because such a modification contradicts a direct teaching of Uozumi. Uozumi clearly states that the second solution contains a weak oxidizing property. This is because the copper oxide film formed by the first solution is removed with a solution having a weak oxidizing property, such as a diluted hydrochloric acid solution (see Col. 9, line 51). Organic acids, such as those required by the claimed invention, have no oxidizing properties. Acids with oxidizing properties are inorganic or mineral acids. In the context of this technology, inorganic acids and organic acids are not equivalent (that is, inorganic acids and organic acids are not interchangeable). One skilled in the art would readily understand this, and consequently one skilled in the art would not have used an organic acid of Kondo or the acetic acid mentioned in the Background section of Uozumi in the second solution of Uozumi.

Since the acetic acid mentioned in the Background section of Uozumi is clearly known by Uozumi, Uozumi would have mentioned acetic acid as a possible acid with a weak oxidizing property if such were suitable. For the reasons stated in the preceding paragraph, Uozumi made no mention. For these additional reasons, with of the rejection is respectfully requested.

The Remaining Obviousness Rejections

Claim 12 has been rejected under 35 U.S.C. § 103(a) over Uozumi in view of Kondo and further in view of Miller (U.S. Patent 6,719,920). Claim 13 has been rejected under 35 U.S.C. § 103(a) over Uozumi in view of Kondo and further in view of Shimazu (U.S. Patent 6,547,843). Claims 17-20 have been rejected under 35 U.S.C. § 103(a) over Uozumi in view of Kondo and further in view of Singh (U.S. Patent 6,594,024). All of these rejections are based on the combination of Uozumi and Kondo. As discussed in detail above, the combination of Uozumi and Kondo is not sufficient to render any of the claims obvious. The additional cited art of Miller, Shimazu, and Singh fails to cure the deficiencies of the combination of Uozumi and Kondo. Therefore, these rejections should also be withdrawn.

Claims 4, 6, and 15 have been rejected under 35 U.S.C. § 103(a) over Uozumi in view of Kondo. Since this rejection is based on the combination of Uozumi and Kondo, the combination of Uozumi and Kondo as discussed above is not sufficient to render any of the claims obvious. However, it is further noted that just because surfactants are known, does not mean that ANY novel use of a surfactant is rendered obvious. There must be some teaching or suggestion in the art to employ surfactants in a two act copper removal process. Since there is no teaching or suggestion anywhere in the art of using surfactants in a two act copper removal process as described by the independent claims, claims 4, 6, and 15 are patentable for this additional reason.

Should the Examiner believe that a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to our Deposit Account No. 50-1063.

Respectfully submitted,

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